WA# 2917
FF#8a

DRAFT October 22, 1993 10/22/1993

TO:Mr. David Croxton
HW-106

FROM:Robert Farrell

SUBJECT: PIER 91--REQUEST FOR VARIANCE FROM USING W-10
OCTOBER 1, 1993 LETTER SUPPORTING VARIANCE REQUEST

The justifications presented in the May, 1993 request to discontinue using W-10 are different from those contained in the October 1, 1993 submittal. In the May request the items were 1) the water levels in W-10 were only accurate to 1" (0.08') (this item is not addressed in the October, 1993 letter), 2)CP-103A and 108A will provide equivalent data as W-10, 3)it takes 30 minutes to take water elevations (not discussed in the October, 1993 letter), 4)(this item was not discussed in the October, 1993 letter), and 5)it can not be determined if there is a floating layer in this well (this item is not discussed in the October, 1993 letter).

item 1--This item is important only if a 0.08' error makes a significant difference in the accuracy of the maps that are drawn. It appears from the contour maps submitted with the October, 1993 letter that changing the elevation of W-10 by +-0.08' would not significantly effect any map drawn with W-10 data on them, however, Burlington demonstrates in the October, 1993 submittal that the removal of W-10 data does significantly impact the direction of ground water flow that is determined from the contour maps.

item 2--Burlington's October 1 letter states that W-10 provides "erroneously low water level data" and that there is a "significant low centered on W-10". It is, therefore, clear that CP-103A and 108A can not provide equivalent data as W-10. The statement that the data from W-10 is erroneous is a conclusion that only can be confirmed by the addition of another well at this location or the demonstration that somehow the measuring equipment is faulty neither of which Burlington demonstrates. Whether the head that is measured at W-10 represents the conditions in the upper aquifer at this location is another question entirely which is addressed below. Whether the low area at W-10 is significance can only be judged when consideration is given to the low areas in the water table at CP-119 in April, 1993, at CP-118 in May, 1993, or at CP-111 at all times that measurements were made. The so-called low at W-10 is of no greater magnitude than any of the other lows.

One other means is available to check the significance of the data at W-10. This involves the comparison of gradients that exist between W-10 and other wells and gradients that are present in similar areas. In April, 1993 the gradient from CP-109 and W-10 is 0.008 whereas the gradient from CP-110 and 103A is 0.006 and the

gradient from CP-110 and CP-111 is 0.009 (these well pairs are all in approximately the same upgradient/downgradient relationships in about the same approximate position in the aquifer as W-10). The gradients are similar to that at W-10.

item 5--The inability to measure if a LNAPL is present or not is an important shortcoming of W-10 and one that should be remedied by the addition of an appropriately constructed well near W-10. The addition of a well near W-10 would of course alleviate most of the other concerns raised by Burlington with the exception of Burlington's claim that the data from the location of W-10 is not necessary at all and is redundant. As was discussed above, Burlington has already demonstrated in the October letter that the same contour maps can not be drawn when W-10 is removed from the maps. Further, it should be remembered that no free product has yet been detected at C-103A or 108A.

THE OCTOBER 1, 1993 LETTER:

The October 1, 1993 letter raises two different items than the earlier variance request:

1)the data from W-10 is "erroneously low", and
2)the screen for W-10 is not in the upper aquifer at all but is located in the aquitard between the upper and lower aquifers.

As was shown above, the gradients around W-10 do not indicate there is anything "erroneously low" about the water levels taken at W-10. Further, given the seasonal irregularities present in the shape of the water table at such wells as CP-119 (April, 1993), C-118 (May, 1993), and CP-107 (July, 1993), the so-called "significant low centered on W-10" loses any significance. This is particularly important in light of the recharge area that is present at or near CP-110 (shown on contour maps for March, April, May, June, and July, 1993). The mound around CP-110 appears to disappear during months when there is little or no rainfall (July it is diminishing and August it has disappeared). This mound of recharge requires ground water to flow to the northwest, southwest, and southeast off this recharge area. At times such as in April, May, and June, 1993, the ground water flow off this recharge area near CP-110 is to the north and northeast back under the marine diesel oil yard. Burlington demonstrates that this mound is present whether W-10 data is included in the contouring or not. W-10 data provides the detail that may more accurately reflect the shallow ground water flow off this mound to the southeast if the data at W-10 is a reflection of the actual conditions in the shallow aquifer in this direction. Burlington also demonstrates the without including W-10 data the ground water flow directions are significantly changed from when W-10 is included on the contour maps.

The only remaining question is the determination of whether the water levels reported for W-10 are representative of the shallow aquifer at this location. Whether W-10 accurately reflects the water levels in the shallow aquifer or not is an issue that concerns the vertical location of the well screen and the determination of whether the screen is within the upper aquifer or not. The Hart-Crowser log for W-10 indicates that silty to very silty sand is present from 6'below the ground surface to below the bottom of the boring at 24' (using the ground elevation of 18 feet indicated on the boring log these depths are elevations of +12' to -6'). The open interval (to include the filter pack and well screen) extends from 12' below the ground surface to 24' below the ground surface (these elevations are +6' to -6'). The water level that is report for W-10 in April, 1993 is -1.43'. This elevation places the water table in the middle of the open interval of W-10.

The Sweet/Edward's (S/E) boring logs for CP-103B and 108A both encountered a silty sand at depths of about 15 feet below the ground surface. This silty sand is considered by Burlington and previous investigators to be an aquitard separating the upper aquifer from the lower aquifer. The boring log, assuming that the boring log descriptions for W-10 are accurate, suggests a 20' rise in the top of the aquitard surface. The elevations for the top of the aquitard at CP-103 and 108 are -10'(+-) and -11.3' respectively. The elevation of the top of silty sand at W-10 would be +12' (18' for the ground elevation minus the 6' to the top of the silty sand). This amount of rise in the aquitard surface seems unlikely based on the other elevations of the top of the silty sand layer.

If it is assumed that the stratigraphy between CP-103 and 108 is consistent with the other borings, the top of the aquitard at W-10 should be at about -10.5' elevation. This would place the top of the aquitard 4 to 5 feet below the base of W-10 at an elevation of -6'. The contour map of the top of the silty sand layer that was submitted as part of the review of the April, 1992 work plan (memo of June 8, 1992) suggests that the elevation of the top of the aquitard should be between -12 and -13 feet or 6 to 7 feet below the bottom of the W-10 well screen. This would suggest W-10 is monitoring the upper aquifer and not the aquitard.

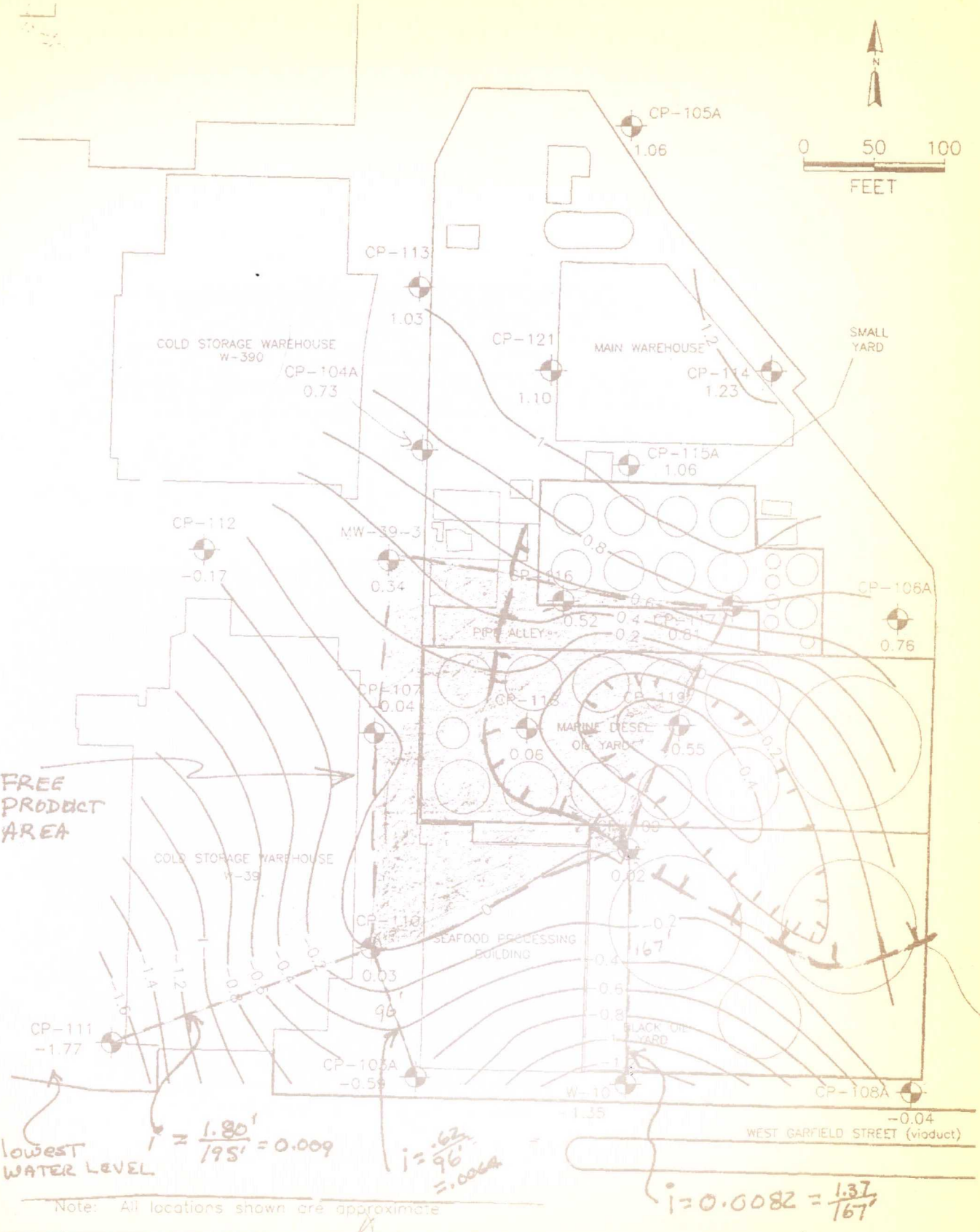
An alternative interpretation based on the measuring point elevations of 6.11 feet given on the water level tables in the October letter suggests that the top of the aquitard should occur at about an elevation of -1.9 feet at W-10. This would suggest that there is a 12 to 13 foot rise in the aquitard surface at W-10. This is still not consistent with the changes in elevations for other borings nor with the boring logs for CP-103 and 108. Again using the other two borings as indicators that the aquitard surface may be at elevation -10.5+- to -13+- feet at the location of W-10, suggests that 3 to 6 feet of the open interval of W-10 is in the upper aquifer and 6 to 9 feet of the open interval of W-10 is in

the aquitard. Given the hydraulic conductivity contract of 30 times suggested by Burlington (ie. the upper aquifer is 30 time more permeable than the aquitard), this would mean that almost all the head measured in W-10 is a result of the open interval in the upper aquifer. In either case, the heads measured from W-10 represent the heads of the upper aquifer at this location.

CONCLUSIONS:

Burlington's contouring of the ground water data for the upper aquifer with and without the data from W-10 has shown that the data from W-10 is important in determining the correct direction of ground water flow. The W-10 location is an important location for monitoring the interior of the Burlington facility. The water level data collected from this well is consistent with those collected in surrounding wells. The data from W-10 provides valuable information on the flow in the upper aquifer that would not be available if this monitoring well is removed from the system. If Burlington believes there is a problem with the data from this well, then the problem with the water elevations at this well are more subtle than the present data or well configuration indicates.

The major shortcoming with the existing W-10 well is its inability to determine if there is a LNAPL present. The presence of free product in both wells upgradient of W-10 suggests that floating product is a real possibility at W-10 locations given that the ground water flow is toward W-10 and W-10 represents a low place in the topography of the water table. For both these reasons W-10 should be replaced with two wells, one for detecting a LNAPL at the water table and the other for detecting a DNAPL at the top of the aquitard. Results from the area of W-10 are necessary to understand the ground water flow within the facility area and to properly detect the actual distribution of contaminate leaving facility by the ground water.



BURLINGTON ENVIRONMENTAL	TITLE: Shallow Aquifer Hydraulic Head April 1993 Pier 91 Facility (how approximate?)	DWN: drp	DES.:	PROJECT NO.: 624878
		CHKD:	APPD:	
		DATE: 9/23/93	REV.: 1	FIGURE NO.: 21